REMARKS

Drawings

The Applicants have addressed the objections to the drawings. The drawings and specification have been appropriately amended.

Specification

Examiner's objection to the specification due to informalities has been addressed by the Applicant. The specification has been amended as suggested by Examiner.

Additionally, the specification has been amended at the paragraph starting on line 12 of page 21, which amendment finds support in FIG. 24c of the Drawings.

Claim Objections

Applicants have addressed the objections to claims 1-15 regarding informalities. Applicants have amended the claims as suggested by Examiner.

Claim Rejections Under § 103(a)

Applicants respectfully disagree with Examiner's assertion that claims 1-5 and 16 are unpatentable over U.S. Patent No. 4,567,765 issued to Rao et al. (Rao) in view of U.S. Patent No. 6,039,059 issued to Bran (Bran).

Rao is directed towards a high pressure-high temperature system for testing fluid samples ultrasonically. Specifically, Rao discloses a fluid chamber assembly that has an improved shape to enhance the reception of a signal by a receiving transducer from a transmitting transducer by reducing the distance between the respective transducers. Rao also teaches an improved sealing arrangement that allows the chamber to operate without leakage at high pressures. Rao fails to teach the use of a housing to isolate the transducers from the hostile environment in the autoclave reactor and fails to teach a cooling means.

Bran discloses a cleaning system for semiconductor wafers using a singular transducer to produce megasonic energy to agitate fluid on the wafer to be cleaned. It also teaches a housing around the singular transducer and a heat transfer member that has an inlet and outlet for coolant to control the temperature within the housing. Bran fails to teach a transducer inside a housing that is able to operate at high pressures. It also does not teach a housing that contains transducers that will be emitting or receiving ultrasound signals to analyze the concentration of a mixture. Nor does Bran teach the use of more than one transducer to measure ultrasonic signals

Examiner states that it would have been obvious to one of ordinary skill in the art to combine Rao and Bran to arrive at the apparatus described in Applicant's original claim 1. Applicant's original claim 1 is directed to an apparatus that measures the concentration and/or particle size of a slurry via ultrasound analysis, which comprises a container for holding the slurry at high temperatures and pressures, transducers for transmitting and receiving signals through the slurry, and couplers that isolate the transducers from the heat and pressure in the container that the slurry is analyzed. While Rao teaches an apparatus for ultrasound analysis, it fails to teach or even suggest isolating the transducers within an isolating coupler outside the ultrasonic chamber. The couplers are essential to Applicant's invention as evidenced in Applicant's specification and claims. See Applicant's Original Specification, p. 8 line 21 - p. 9 line 11; p. 3, line 18-21; p. 9 line 17 – p. 10 line 14. The advantages to the presence of the couplers include the ability to operate the transducers with reactor temperatures exceeding 265°C and above, pressures in the reactor as high as or above 200 p.s.i., and the ability to use and change the transducers easily. If it had been obvious to place the transducers within couplers to isolate them from the hostile environment of an autoclave reactor, then surely Rao would have taught this or suggested that this was a desirable modification.

The Applicant respectfully suggests that it would not have been obvious to combine Rao and Bran to arrive at the invention in Applicant's original claim 1 because obviousness cannot be established by combining teachings of the prior art to produce the claimed invention, absent some teaching, suggestion, or incentive supporting the combination. ACS Hospitals Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577 (Fed. Cir. 1984). It is neither taught nor suggested in either Rao or Bran that the two devices be combined to produce the Applicant's invention.

Furthermore, it would not be obvious to combine Rao and Bran because Bran is not found in an art that is analogous to that of Applicant's invention. Bran teaches a system for cleaning semiconductor wafers, and not a system for ultrasound analysis of slurries. An inventor is only presumed to have knowledge from those arts reasonably pertinent to the particular problem with which the inventor is involved. In re Antle, 58 C.C.P.A. 1382, 1387, 444 F.2d 1168, 1171-72 (1971). Applicant here is concerned with conducting ultrasound analysis of slurries under high temperatures and pressures. Bran does not deal with analysis of anything; rather, Bran is directed towards cleaning semiconductor wafers using megasonic energy. It cannot be presumed that Applicant has knowledge of art in the area of semiconductor wafer cleaning, when he is mainly concerned with protecting transducers from high temperatures and pressures when performing ultrasound analysis of various mixtures.

Even if the two references suggested by the Examiner were combined, the resulting apparatus would not be the same as Applicant's invention. Applicant's invention teaches transducers in housings that are placed outside the high temperature-high pressure environment of the material being analyzed. If the two references suggested by the Examiner were combined, an apparatus would be created where the transducers are vertically oriented and part of the overall structure of the chamber assembly, as taught in Rao. This would not be the equivalent to the apparatus of Applicant's invention because Applicant teaches a reactor that has transducers that are horizontally oriented. Additionally, if the transducers were not a part of the structure of the chamber assembly, as they would not be in Applicant's invention, the apparatus would lose its ability to maintain the pressure within the chamber in the manner found in Rao because the top and bottom structures that the transducers are contained in would not be in contact with the body of the assembly and would not be able to keep a seal around the chamber where the mixture is analyzed. Maintaining pressure inside the reactor vessel is essential to Applicant's invention, as well as Rao. For the above stated reasons, the Applicant's submit that claim 1 distinguishes over Rao in view of Bran and is in allowable form.

Claim 2, which is dependent on claim 1, is believed to distinguish over Rao in view of Bran for the same reasons as recited above for claim 1. Rao does not disclose or suggest a means for cooling the transducers or even the desirability to cool the transducers to ambient temperatures. This feature is critical to Applicant's invention because prior art cited in the specification shows that these previous devices were limited to use under ambient temperatures. See Applicants Original Specification, at p. 1 line 14 through p. 2 line10. The ability to cool the environmentally sensitive transducers and maintain them at ambient temperatures allows the analysis of the mixture to be performed under normal reactor conditions that exhibit very high temperatures and pressures, upwards of 250°C and 200 p.s.i., respectively. See Applicants Original

Specification, at p. 3 lines 13-21.

Claim 2 teaches that the purpose of the coolant is to maintain the first and second transducers at ambient temperatures by circulating coolant in the area around the transducer and adapter. This is to protect the transducer from the high temperatures within the reactor vessel. Rao does not disclose a source of coolant to maintain the transducer at ambient temperature, nor does it suggest that such a modification would be desirable. Bran discloses a coolant that is pumped through an annular groove around the heat transfer member, which cools the heat transfer member and indirectly cools the transducer by way of being close to the heat transfer member. This is to protect the transducer from heat generated when significant amounts of wattage are applied to the transducer. Bran does not teach or suggest that a coolant can be directly circulated around the transducer itself in order to maintain it at ambient temperatures, as is found in Applicant's specification.

Additionally, if it were obvious to one of ordinary skill in the art to cool the transducer during analysis of a mixture in a reactor, Rao could have disclosed such a modification in his claims or specification. Furthermore, it has not been suggested in Rao to cool the transducers, nor has it been suggested in Bran to combine the references to obtain Applicant's invention.

Even if Rao and Bran were combined as suggested, the resulting apparatus would not be similar to that of Applicant's invention in claim 2. The apparatus would be similar to the one described above in the discussion of claim 1, but the cooling would be performed by circulating a coolant around the heat transfer member rather than directly around the transducer. It is for these reasons that Applicant respectfully submits that claim 2 is patentable over Rao in view of Bran.

Claim 3, which is dependent upon claim 2, is believed to distinguish over Rao for the reasons recited above. Claim 3 teaches that the couplers around the transducers are in the form of generally closed housings. Rao does not disclose a coolant to maintain the transducers at ambient temperature, which is described in claim 2 of Applicant's invention and upon which claim 3 depends. Additionally, Rao does not describe a housing at all, it merely describes a top and bottom part that connect with the body to form a seal that maintains the pressure of the chamber assembly. Nor does Rao describe that the top or bottom of its chamber assembly is generally closed. Therefore, claim 3 is patentable over view of Rao.

Claims 4 and 5, both of which are dependent upon claim 3, are believed to distinguish over Rao in view of Bran for the above recited reasons. The Examiner is correct in his assertion that Rao does not disclose a housing in the general form of a disc because Rao does not disclose a housing. Claim 4 teaches a housing with a peripheral lateral wall to which the coolant source is attached, and two opposing ends which are coupled to the sealed container and a transducer, respectively. Claim 5 teaches a housing with a circular wall with opposed ends which are respectively coupled to the sealed container and a transducer, and the coolant source is attached to the opposed end that is coupled to the transducer. Bran discloses a transducer and heat transfer member that are both contained within the housing. See Bran, column 5, lines 16-17. The housing in Bran is not coupled to the transducer; the transducer is completely contained within the housing. Additionally, there is no teaching or suggestion in Bran that the transducer need not be contained completely within the housing or that the device would function if such a modification were made.

With reference to claim 5, Bran does not disclose a housing where the source of coolant is connected to the opposed end wall coupled to the transducer, nor does it suggest such a combination as that found in claim 5. The source of coolant in Bran must be on a lateral wall because it feeds directly into the annular groove of the heat transfer member. Where there is no suggestion, teaching or incentive in the prior art supporting a combination of references, obviousness cannot be established by combining the teachings to produce the claimed invention. ACS Hospital Systems, Inc. v. Montefiore Hospital, 732 F.2d 1572, 1577 (Fed. Cir. 1984). Therefore, claims 4 and 5 are patentable over Rao in view of Bran.

Claim 16 is similarly directed to an apparatus for ultrasound analysis of slurries, comprising an autoclave reactor to maintain the slurry at elevated temperatures and pressures, and transducers for transmitting and receiving ultrasonic signals that transit the slurry that are enclosed in couplers to isolate the transducers from the elevated temperatures and pressures of the reactor, as well as means to cool the transducer that is contacting an acoustic member. Claim 16 is patentable over Rao in view of Bran for the reasons cited above for allowance of claims 1-5. Rao's teachings are discussed above, as are those of Bran. Also as indicated above, there is no teaching in Bran or Rao to combine the references to create the present invention. Absent some teaching, suggestion or incentive supporting the combination, obviousness cannot be established by combining the teachings of the prior art. The mere fact that the prior art may be modified in a manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification. In re Fritch, 972 F.2d 1260, 1266 (Fed. Cir. 1992). Rao does not suggest the desirability of protecting the transducers from the elevated temperatures or pressures within the reactor chamber, or of placing them in a housing for any reason. Bran does not suggest that the housing be used to protect the transducer from heat or pressure generated from a source outside the housing itself.

Bran discloses a transducer that is coupled to a heat transfer member that is coupled to a probe that transmits the acoustic energy created by the transducer to the semiconductor wafer to be cleaned. Claim 16 of Applicant's specification teaches a transducer that is directly coupled to an acoustic member that is coupled to the sealed container. There is no heat transfer member in Applicant's invention, there is only a connector that connects the acoustic member to the sealed container. The acoustic member in Bran, the probe, is attached to an annular plate that is connected to the tank. Additionally, the connector in Applicant's invention is isolated from the acoustic member by the formation of a cavity when it is connected. None of these elements are found in Bran or Rao, nor are they suggested in either invention.

Additionally, the invention in Bran is not in an art that is analogous to that found in Applicant's application and Rao. An inventor is only presumed to have knowledge of those arts reasonably pertinent to the particular problem with which the inventor was involved. In re Antle, 58 C.C.P.A. 1382, 1387, 444 F.2d 1168, 1171-72 (1971). Here, the Applicant's were concerned with limitations of transducers used in ultrasound analysis. The Bran reference cited by the Examiner is associated with cleaning semiconductor wafers. Knowledge of the field of cleaning semiconductor wafers cannot be imputed to the Applicant because it is a wholly unrelated field to ultrasound analysis. Therefore, the Applicant's invention and Bran are not analogous arts, and Bran cannot be used against the present invention to show obviousness. Accordingly, claim 16 is patentable over Rao in view of Bran for the reasons stated above.

Allowable Subject Matter

Applicants kindly thank Examiner for indicating that claims 6-14 and 15 are allowable subject matter. Claim 6 has been rewritten in independent form.

CONCLUSION

For the foregoing reasons, Applicant respectfully requests that the Examiner allow Original claims 2-5, 7-10, 13-16, Amended claims 1, 6, 11-12, and New claims 17-19 as indicated on the attached complete listing of claims.

Respectfully submitted,

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Attachment(s)

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